Space Weather Forecast

Issued on Saturday, 02 December 2023 at 01:25 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further G1-G2 Minor to Moderate storms expected at first, easing later day 1 (02 Dec). Chance of M-class flares (R1-R2 Blackouts).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity is at Moderate levels with the largest flare of the previous 24 hours a Moderate flare peaking at 01/0439 UTC from the far northwest, a further Moderate fare was recorded at 012120 UTC from the large region in the southwest disk. There are currently ten sunspot regions on the visible disc. Two new regions have emerged in a similar quadrant of the northwest disc in recent hours. The most westerly of the two regions has developed quickly and is now numbered. The complex region in the southwest remains the largest and most significant region.

A number of filaments (lines of the Sun's material held together by the magnetic field) currently lie on the Earth facing side of the Sun and can erupt to produce coronal mass ejections (CMEs). The lift off of one of these in the SE disk was observed around 01/1400 UTC, the resulting CME still awaiting full analysis but not expected to be Earth directed. A CME signature was observed in association with the most recent moderate flare from AR3500, we await data for analysis. Other CME signatures in imagery during the past 24 hours are considered far-sided and thus not Earth-directed.

Solar Wind / Geomagnetic Activity: Solar wind speeds began the period around 450 km/s (Slightly Elevated). This likely associated with the arrival of the CME from late 27 Nov. Speeds slowly declined to around 400km/s until 01/0850 UTC, when speeds suddenly increased to 500-560km/s (Elevated) as the CME from 28 Nov arrived at L1 and have persisted at Elevated levels.

The Interplanetary Magnetic Field (IMF) was Weak until the first CME arrived, increasing to mainly Moderate, but briefly Strong levels. Following the arrival of the second CME the IMF increased to more persistently Strong levels and remaining erratically at Moderate to Strong levels into the period. The important north-south component of the IMF varied Weakly at first, then varied Moderately following the first CME. A stronger response was evident with the arrival of the second CME, becoming Strongly negative (southward directed) before easing to Weak or Moderately negative by the end of the period.

Resultant Geomagnetic activity was Unsettled to Active (Kp3-4) between 01/0000-0900 UTC. Activity increased further to G3/Strong Storm levels 01/0900-1200 UTC, with further G1-G2 Minor to Moderate Storm intervals recorded 01/1200-1500, 1800-2100 and 2100-2400.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) persisted at Background levels with no solar radiation storms occurring.

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Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate with a chance of further isolated Moderate-flares (R1-R2 Blackout), and a very slight chance of an isolated Strong-class flare (R3 Blackout). The moderately large region in the southwest disc is most likely to be the source of any significant flares.

Solar Winds / Geomagnetic Activity: Geomagnetic activity and solar winds should slowly wane during the first 24 hours as current CME influence begins to ease, but with further G1-G2 Minor-Moderate Storm intervals expected at first and a slight chance of isolated further G3 Strong Storm intervals. Activity expected to become generally Quiet to Unsettled into day 2 (02 Dec) as winds return to background levels, remaining so until the arrival of the fast winds later day 3 (04 Nov) or perhaps early day 4 (05 Dec), associated with the large coronal hole approaching centre disk. The onset of which should see winds reach Elevated to Strong levels and geomagnetic activity increase to Active to G1-G2/Minor-Moderate Storm (Kp 4-6) levels for a time.

Aurora: Current activity maintaining a chance of visible aurora for parts of the UK into the early part of day 1 (02 Dec). Views of the aurora as far south as Northern England and Northern Ireland are possible, with a greater chance further north where skies are clear. Further aurora activity possible into the evening of day 3 (04 Dec) with the expected arrival of faster solar winds.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is expected to stay at background. However, any significant flares from the moderately large region in the southwest will bring a chance of flux levels increasing, with a slight chance of approaching or perhaps exceeding the S1 Minor Radiation Storm level.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	80	5	60	30
Strong	G3	Yes	5	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	40	35	35
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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